

Guidelines to Address Challenges Faced by Last Planner Users and Implementers at Organizational and Project Levels

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Abstract

Plan unreliability is a crucial problem in construction industry. As the industry is fragmented and every project is unique, schedule delay is common phenomenon in the industry. Ballard and Howell proposed that shielding construction and stabilizing work flow is a solution to this problem. These two researchers along with other lean construction scholars developed last planner system (LPS) of production control through a series of experiments since 1994 to address these issues. LPS is a popular tool among lean construction community to stabilize work flow and make plans more reliable. However, LPS users and mentors report various challenges that they face during implementation and use of the system at organizational and project levels. This paper discusses the findings from the literature survey and from LPS users' perception survey about the challenges faced by construction professionals during the implementation and use of LPS. The initial findings indicate that senior management is taking proactive approach and there is a continuous improvement in implementation and use of LPS. The respondents do not agree with most of the challenges mentioned in previous case studies on LPS. Moreover, experienced LPS users report high degree of disagreement to these challenges. This is an ongoing research. The main objective of this investigation is to assess the challenges faced by construction professionals during implementation and use of LPS and propose guidelines to address these issues.

Keywords: Last Planner System, Challenge Assessment

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Introduction

The US Bureau of Labor Statistics (Teichloz, 2004) reported that construction industry is facing a severe decrease in labor productivity. Current research (Tommelein 1999, Fernandez-Solis 2007) in the industry shows evidences that complexity, variability, and uncertainty are the major causes of this decrease in productivity. Howell and Ballard's (1994) experiments with last planner technique¹ indicated that the use of formal and flexible production planning procedures is the first step to keep the production environment stable. LPS is an effective tool for plan reliability (Alarcon et. al 2008). LPS is designed to shield production units from work flow uncertainty (Ballard-LCI-WP). Several industry professionals have applied LPS to solve different problems associated with unstable work flow and uncertainty, the root of unpredictability. There is plenty of literature on the use of LPS on various construction projects. Majority of this literature comes from the academic and industrial backgrounds in the form of case studies. Case studies written since the inception of LPS report its use in different project settings (building construction, heavy civil construction etc. at different parts the world) and for different project phases (definition, design, pre-design, construction). Authors of these case studies also mentioned the challenges faced and lessons learned by different stakeholders during the implementation (initial training and kick off) and use of LPS later in various projects. This research effort summarizes these challenges and assesses the current state of challenges in LPS implementation and use in the industry.

Last Planner System

LPS is a planning, monitoring and control tool that follows lean construction principles such as just-in-time (JIT) delivery and value stream mapping (VSM) and pull scheduling (also known as reverse phase scheduling).

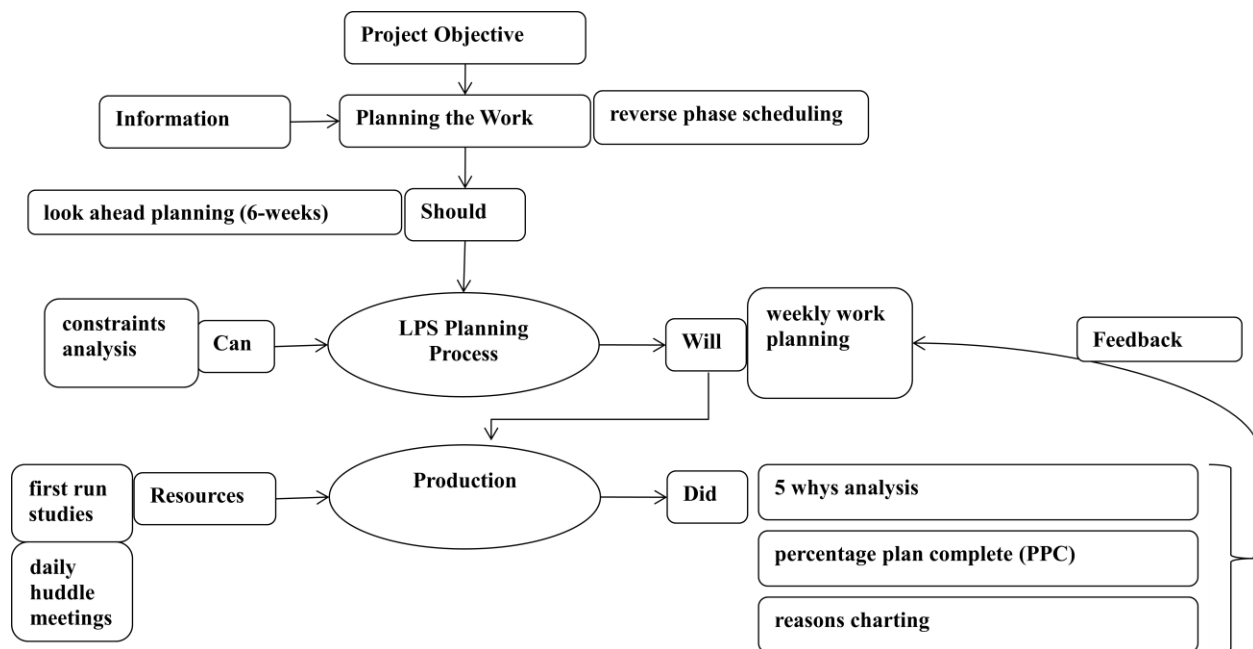


Figure 1: Last Planner System (Ballard, 2000)

The primary function of LPS is the collaborative planning process that involves ‘last planners’¹ to plan in greater detail as team gets closer to doing the work. Moreover, LPS is based on ‘pull scheduling’² principle where only the work that CAN be done is promised by last planners in weekly work plan meetings as compared to conventional ‘push scheduling’³ where the work that SHOULD be done is planned in weekly meetings and emphasis is on sticking to the master schedule. Constraint analysis is an

integral part of LPS that is applied to take a proactive approach to problem solving as faced during the day to day construction projects (Ballard, 2000). In addition to that, Plan-Do-Check-Act (PDCA) principle is followed by LPS as it encompasses a protocol to identify the reasons for non-compliance to plan using the ‘5-whys⁴’ analysis and maintaining a feedback loop.

The Last Planner system of production control can be characterized in terms of the principles that guide thinking and action, the functions it enables to be performed, and the methods or tools used to apply those principles and perform those functions (Ballard et. al 2009).

LPS Implementation and Use in Construction Industry

The Last Planner system of production control is in wide use throughout the world. The LPS implementation starts with a pilot project in the majority of companies. There are several such instances where implementation of LPS on different construction projects has been reported and improvements in labor productivity, safety, quality and project delivery time are pointed out on a variety of construction projects (Courte et. al 2009, Ballard et. al 2007, Khonzade et. al 2008, AlSehaimi et. al 2009, Ballard et. al 2009, Formoso et. al 2009, Friblick et. al 2009, Garza et. al).

Sutter Health in USA started the implementation of LPS on five pilot projects (David Medical Office Building, Modesto 8 Storey Bed Tower, Delta, Roseville Emergency Department, Roseville Parking Structure) as a part of organization’s lean initiative in 2004 (Ballard et. al, 2007). After a series of experiments LPS is in use on a number of Sutter Health construction projects now (Hamzeh, 2009). In Finland four major companies (YIT Rakennus Oy, Skanska Talonrakennus Oy, NCC Rakennus Oy and Rakennusosakeyhtiö Hartela) implemented LPS on four pilot projects and developed a systematic implementation approach (training and theoretical justification etc.). These pilot projects were followed up with a second set of pilot projects. Productivity, safety, quality and schedule benefits were realized in these projects (Koskenvesa et. al, 2009). Use of LPS improved communication and coordination among subcontractors on a multistory residential construction project (Song, 2009).

In addition of various benefits; challenges faced by construction professionals during the implementation and use of LPS is also reported by academic and industry research. Table 1 lists the challenges and their occurrences in the literature. It has also been noticed that construction professionals face challenges at two stages. First is the implementation stage, when project team is introduced to LPS and pilot projects are in progress. These challenges are organizational challenges faced by senior and middle management in the initial stages. The second stage is the LPS use by experienced team, which includes the technical challenges of skills in using LPS effectively.

Research Method

The literature review stage of the research exposed the challenges that construction professionals are facing during implementation and use of LPS. According to the researcher's observation and reviewed literature the challenges fall under two categories, implementation phase and continual use phase. Also the challenges are faced at organizational and project levels. The rationale used to select lean's LPS tool for study was related to the amount of literature on LPS use and implementation in various countries.

The research is divided into two phases due to dependency of second phase on the results from first phase. The first phase includes the assessment of challenges faced by construction professionals in LPS use and implementation. Literature review and survey instrument is being used for this purpose. The second phase includes the identification of best practice examples from the industry and collection of expert opinions to address the challenges identified in first phase. Literature review and personal interview tools will be used for this purpose.

First phase: Assessment of challenges faced by construction professionals in implementation and use of LPS

Lean Construction Institute (LCI), International Group of Lean Construction (IGLC) and European Group of Lean Construction (EGLC) members constitute the sample group for the survey in the first phase of the research study. The requirement for the selection of the organizations is based on the experience with LPS implementation and use of the members and their respective companies. Questionnaire survey is being used as a primary data collection tool in this phase. The designed questionnaire is prepared based on the literature review and expert opinions. Three questionnaires are developed based on the categorization of challenges. The first questionnaire is designed to assess the challenges that senior and mid-level management faces during the LPS implementation phase. This questionnaire includes questions on implementation challenges at organizational level. The second questionnaire is designed to assess the challenges faced by front end management during the use of LPS in day to day life on a project. Thus this questionnaire includes questions on user challenges at project level.

The questionnaires, which formed the basis of the first phase of the study, consisted of two main sections: (1) respondent's perception survey (2) respondent profile

The first section includes the questions on respondent's perception about various challenges that an LPS implementer or user may face. The second section includes the questions on respondent's profile to analyze the influence of respondent's environment on his/her perception.

Second Phase: Identification of best practice examples and collection of expert opinions to address the challenges identified and assessed in first phase

Experts on lean construction and LPS will be interviewed for expert opinions to address the issues highlighted in first phase. The selection will be based on the experience with lean construction and LPS and scholarly and research profile in lean construction and LPS arena.

Initial Findings

The literature review resulted in a set of challenges that are listed in Table 1. When this paper is being written, it's been less than fifteen days when the survey was uploaded online. However, Following are the initial findings from 30 senior and middle management respondents.

Respondents' Profiles:

- All the respondents had experience with implementing and using LPS.
- Respondents are members of Lean Construction Institute (LCI).
- Construction Industry Experience (Avg.) = 21 years
- Experience in using LPS (Avg.) = 4 years

- 85% of respondents worked on LPS projects based in USA.
- Total number of respondents: 44 (Survey is still open and accessible at <http://tinyurl.com/yyfqtrs>)

Table 2: LPS Implementation Challenges Today

Implementation Challenge	% of Respondents Agreed
Lack of training	33%
Resistance to change	37%
Lack of leadership	30%
Lack of management commitment	26%
Lack of experience in using LPS	44%
Organizations face internal conflicts	48%
Organizations face external conflicts	48%
Organization not getting good support from the client	44%

- Only 37% respondents said they apply LPS from the beginning of the project.
- 30% of respondents said they feel blamed whenever there is a mistake while using LPS.

How these challenges are being addressed?

- 63% of respondents said they have a formal training program for teaching lean principles and implementing Last Planner System in their organizations.
- 59% respondents said their organization has a strategy for implementing Last Planner System.
- 85% of respondents said their organization runs LPS in parallel with other improvement programs such as safety improvement and quality control.
- 56% respondents said the superintendents or foremen prepared the weekly work plans when LPS was implemented.

Conclusion

It is noticeable from the literature that there are several instances when construction professionals faced challenges during the implementation and use of LPS. However, initial findings from the survey imply that-

- Organizations started addressing the issues identified in previous studies by means of periodic training sessions on lean principles and LPS.
- Organizations are willing to improve their LPS implementation practices by having a strategy for development and deployment of LPS.
- The challenges faced depend upon the years of experience in using LPS and number of projects done with LPS.

This is an ongoing research and all findings from first phase and second phase will be published in the next paper.

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